

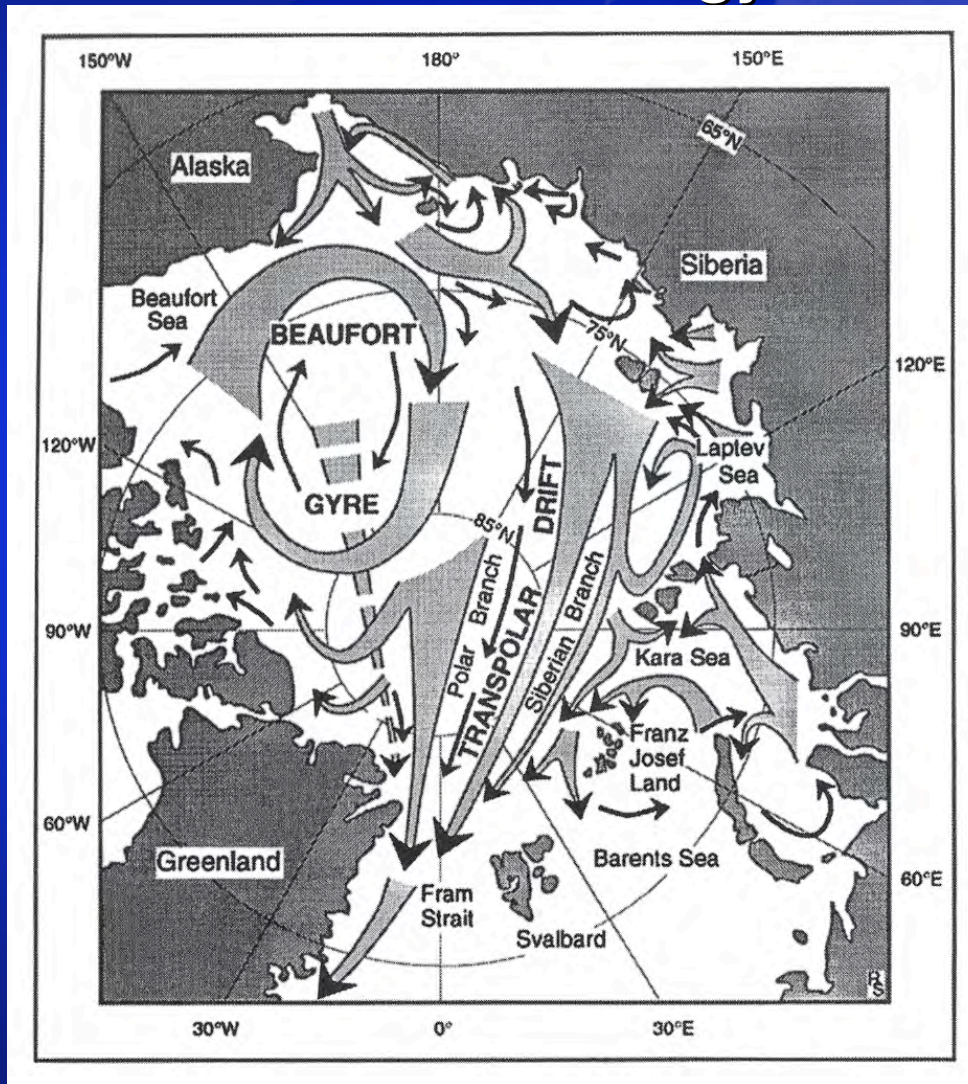
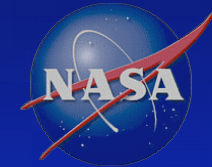
Sea Ice Motion And Deformation



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SPG Meeting, San Diego
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Large scale sea ice circulation -Climatology from 70-80s



Ice Motion: 0-40 km/day: wind-driven at short time scales; ~1-3% of geostrophic wind

Beaufort Gyre:
Time to make 1 circuit: 5yrs

Transpolar Drift Stream:
Time to traverse: 3 yrs

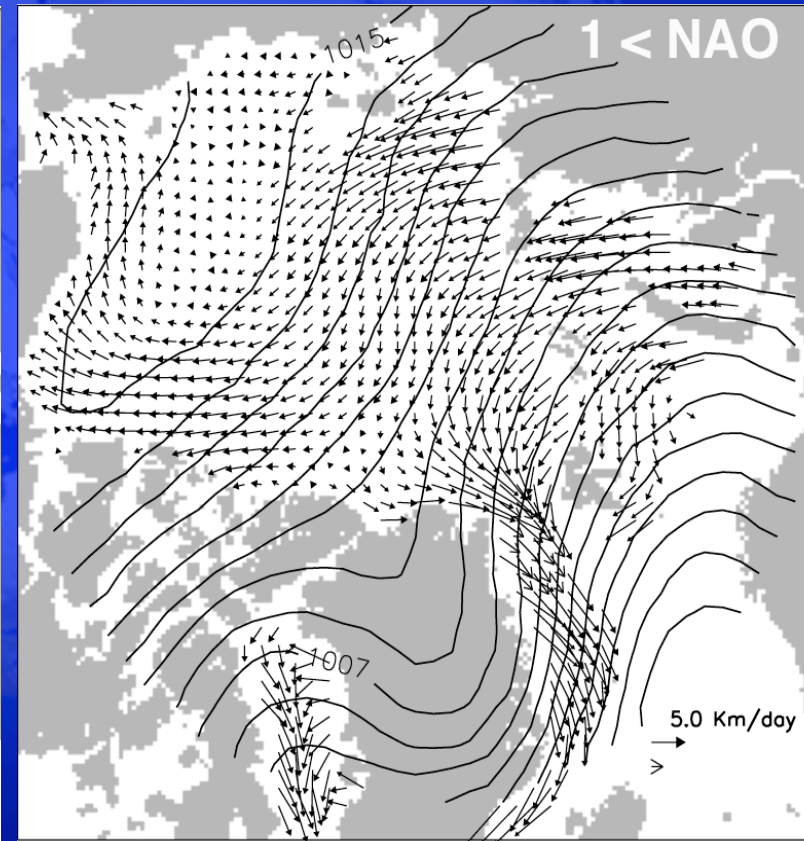
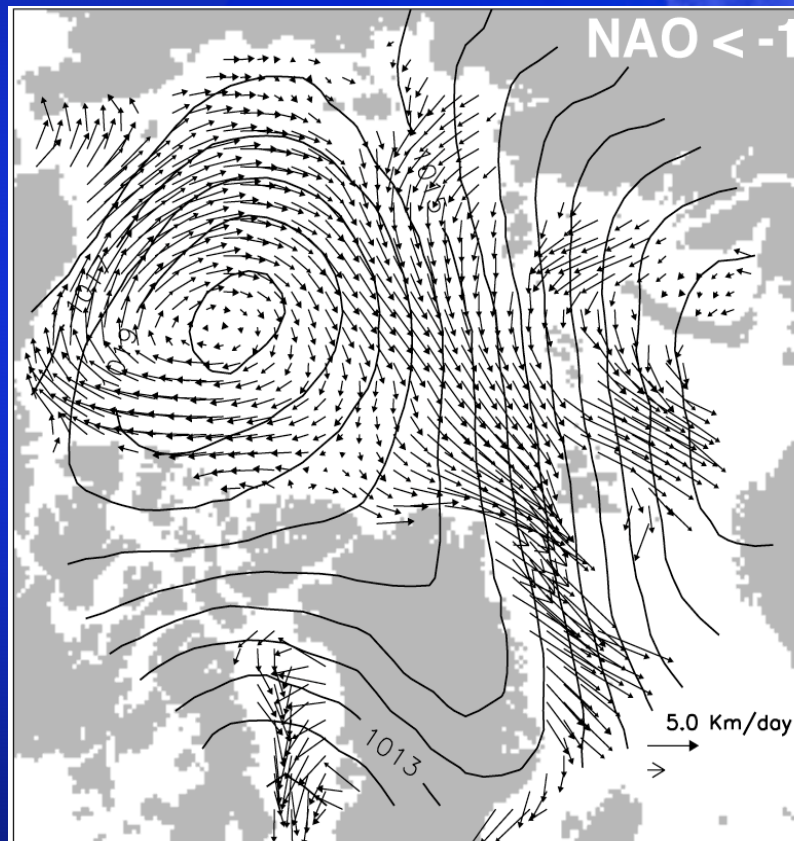
Ice Area Flux through Fram Strait: $\sim 10^6 \text{ km}^2/\text{yr}$

Ice Volume Flux:
 $\sim 3000 \text{ km}^3/\text{yr}$ or 0.1 Sv
(fresh water flux second only To the Amazon)

Changes in Circulation Pattern

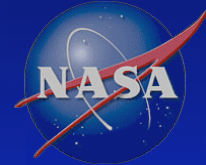
1970-80s

1990-on





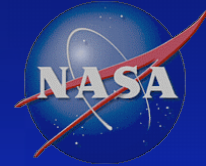
Remote Sensing of Ice Motion



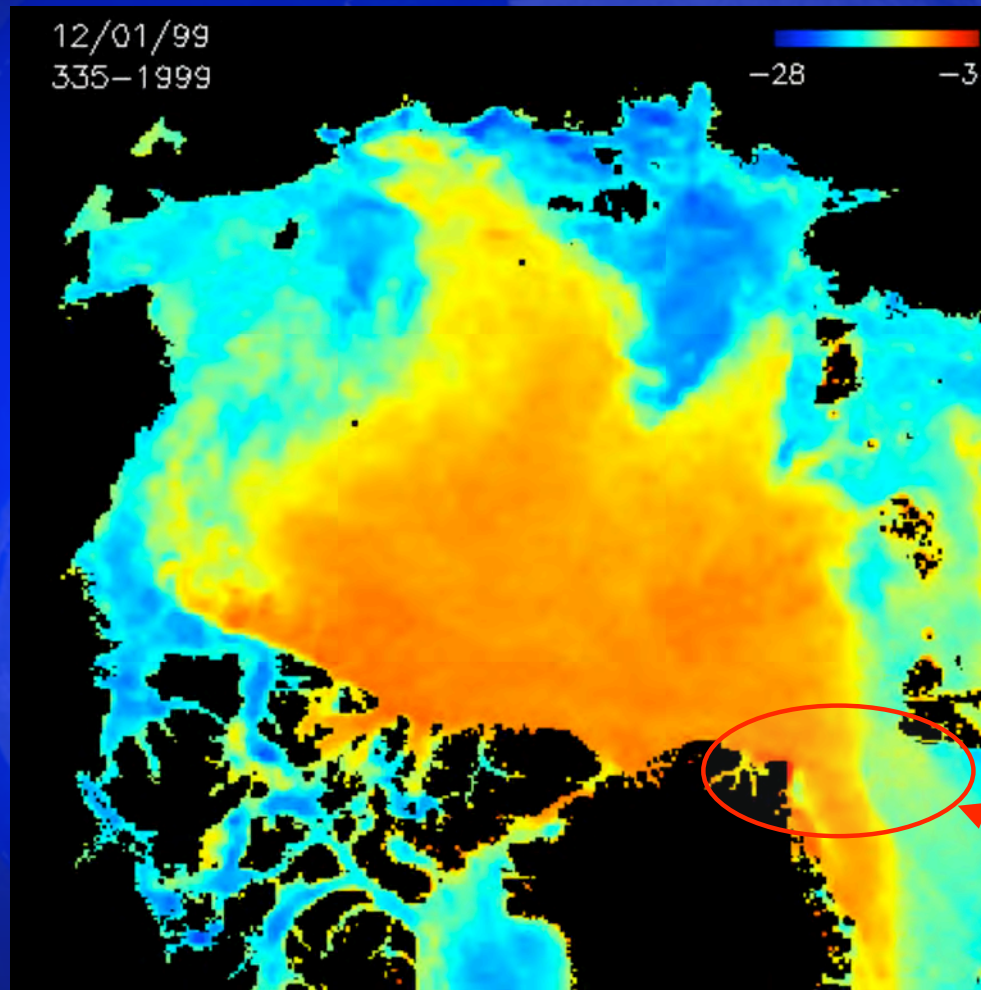
- Tracking of common features in sequence of images. (Displacements)
- Sensors/uncertainties
 - Passive microwave (SSM/I) / ~4 km (daily)
 - QuikSCAT/ ~4 km (daily)
 - AVHRR/ ~ 1 km (clear sky ~daily)
 - SAR / ~100m (3 days)
- High temporal and spatial resolutions required for sampling fine scale geophysical processes.



Sea Ice Motion



- QuikSCAT
Observations
of the Arctic
Ocean



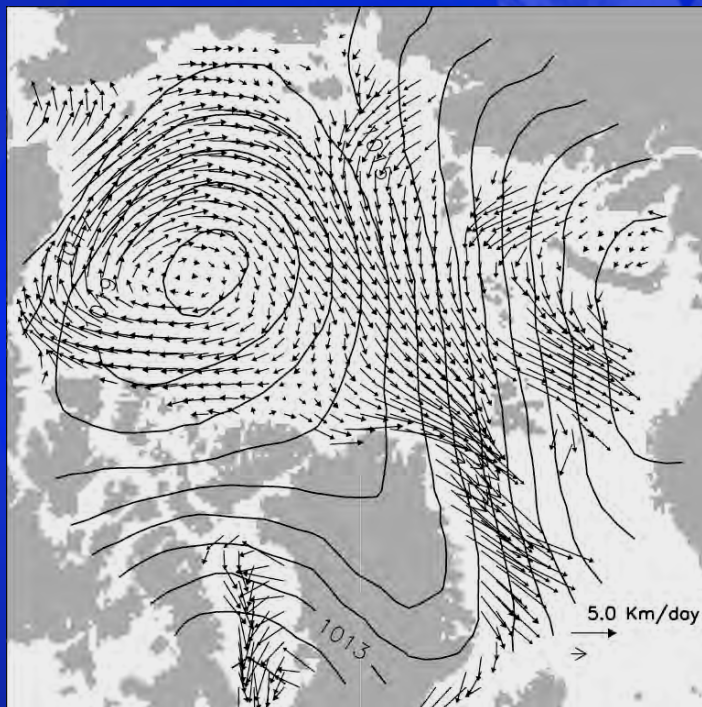
1000 km

Resolution:
~12.5 km
Scatterometer

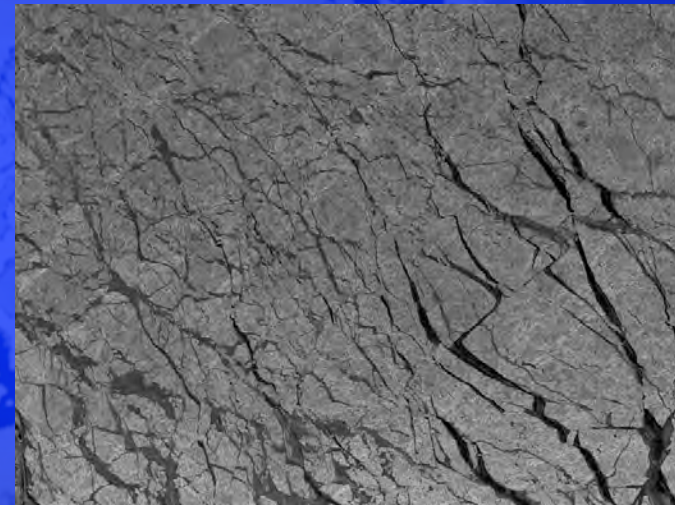
Fram Strait

Ice Drift (Large scale circulation - small-scale deformation)

2000 km



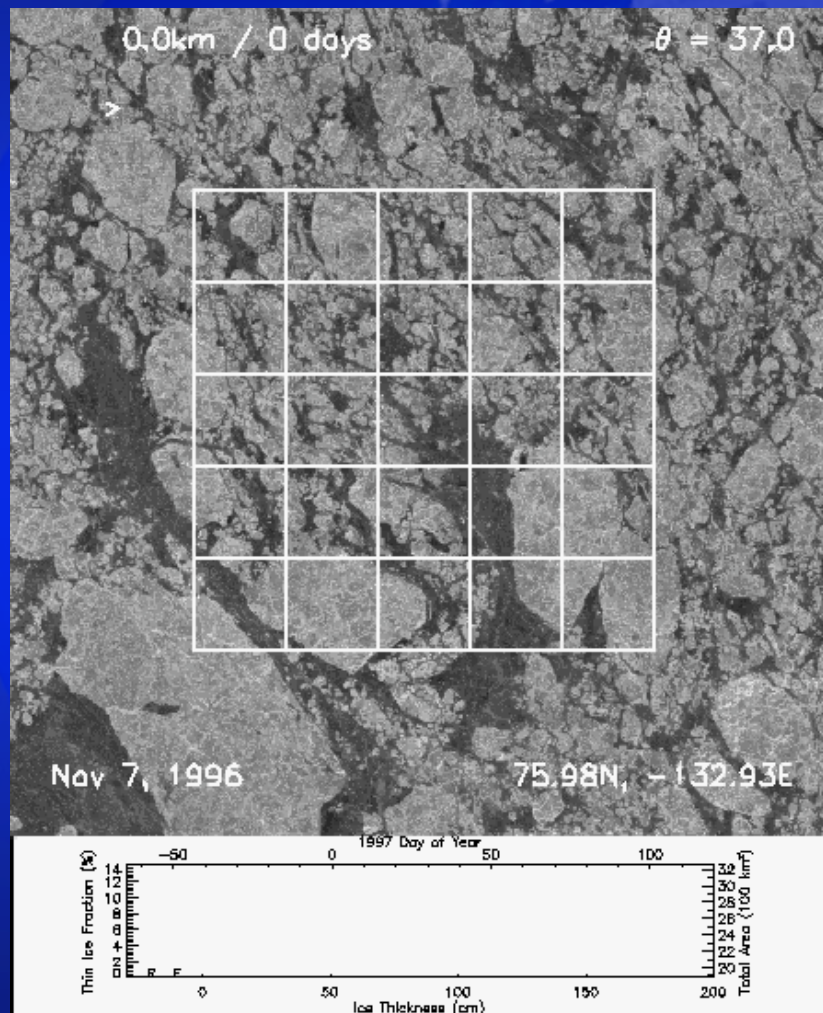
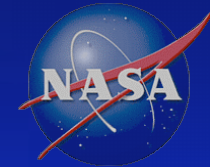
100 km

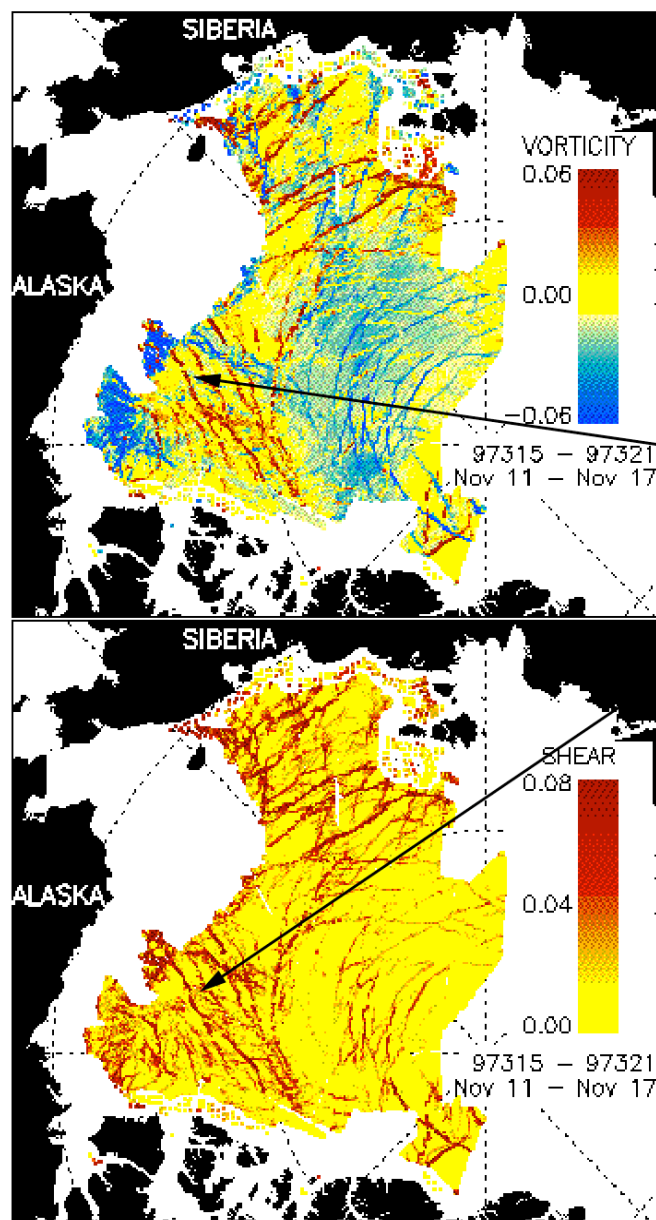


(Kwok, 2002)



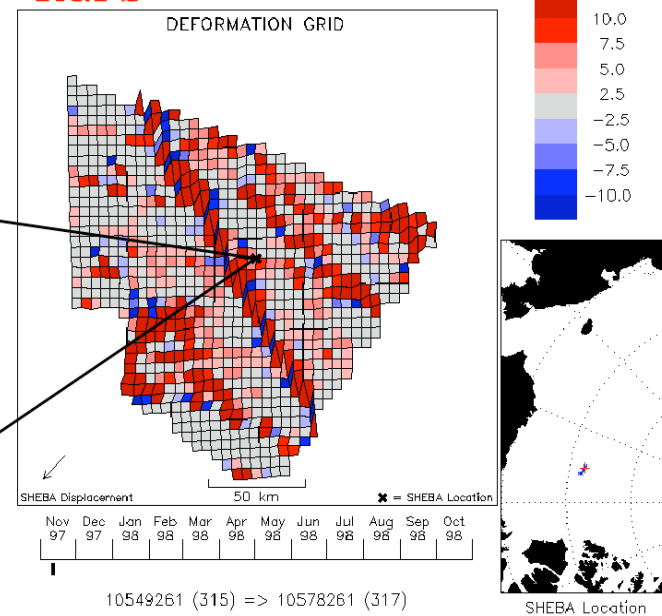
Deformation of 5 by 5 (10 km by 10 km) Lagrangian Elements November - April





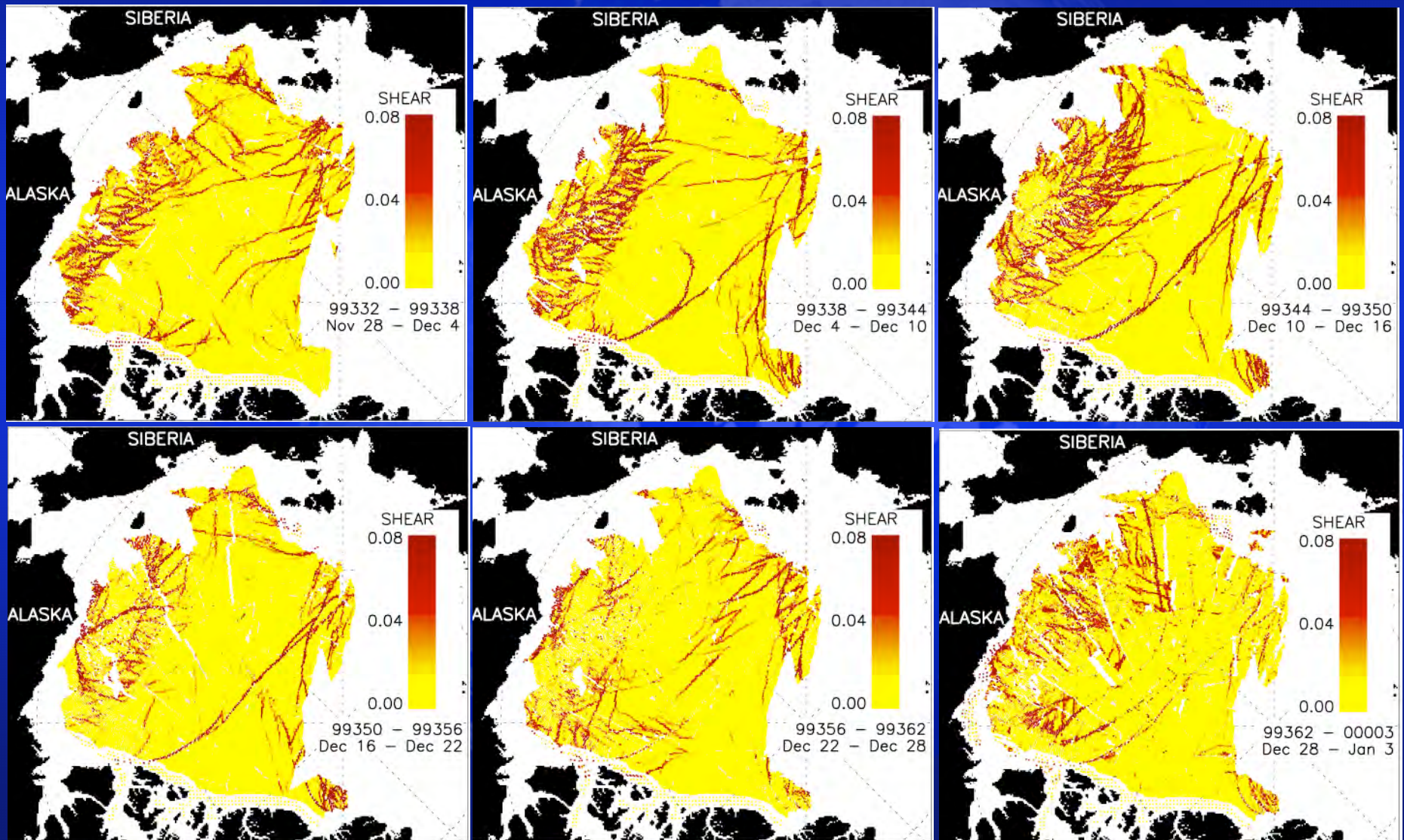
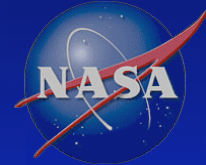
Location of SHEBA, Nov 97

RGPS





Shear





Time-varying deformation (Divergence)

